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Data Visualization of Covid 19 Using Tableau

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Abstract— The globe is producing 52 times as much data as it did in 2010 and 76 times as many information sources in 2020. Huge opportunities arise from being able to access this data, and in order to take advantage of these opportunities, people must use data to resolve issues. Regrettably, at a time when there is a worldwide pandemic and people are looking for trustworthy, credible information regarding COVID-19, Tableau plays a crucial role in this scenario since it is a very powerful tool for quickly and simply visualizing large amounts of data. It includes a drag and drop interface that is simple to use. Beautiful visualizations may be created quickly and with ease. There are numerous data sources that Tableau supports. With Tableau's COVID-19 (Coronavirus) analytics, you can build dashboards that make it easier to find the story in our data and help us comprehend the effects of COVID-19 (Coronavirus). Finally, the relative number of confirmed, recovered and death cases in India as well as the entire world are shown with data visualization. We will see the trends of some diseases which occurred as an after-effect of Covid-19.

Keywords: COVID-19 (Coronavirus); Data Analytics; Tableau; Visualization; Dashboards; Visual Analytics

I. INTRODUCTION

A wide range of networks, including YouTube, Tumblr, Reddit, Facebook, WhatsApp, Twitter, Instagram, Gmail, LinkedIn, and academia, are currently used to produce data. It is important to comprehend this information because it is necessary for organizations, countries, and institutions to function. Big data is a collection of various, complex data sets that are difficult to manage with standard data processing application software. The data set can be examined and visualized in order to identify new business trends, identify diseases, forecast new paradigms, stop crime, and other things.

The most widely used tool for data analytics, visualization, and discovery right now is Tableau. Tableau is one of the business intelligence (BI) tools that is growing the quickest. It is incredibly fast, easy to use, and quickly deployed. Users may investigate and understand their data with the help of interactive visualizations created with Tableau. Benefits of the programme include its versatility in working with virtually any database and its simplicity in use, allowing users to create interactive visualizations expressing chosen formats by simply dragging and dropping files. The COVID-19 (Coronavirus), a true global pandemic, has afflicted people in practically every nation on earth. How effective Tableau is for COVID-19 (Coronavirus) data analytics may be determined by looking at its functionality, user friendliness, and speed.

Tableau is a tool used for complex data visualization and simplification. Without the aid of programmers or any prior

programming skills, it was designed to make it simpler for individuals to build images and visualizations.

Data visualization is an intuitive technique for consumers to quickly understand and comprehend data, especially in huge data analysis.

It helps to improve the quality of governance policies or services by giving a comprehensive picture and supporting facts for better decision-making. Tableau gives customers access to numerous data sources and a simple drag-anddrop interface for creating charts, maps, dashboards, and storytelling.

This study describes a technique for interactively visualizing and analysing COVID-19 (Coronavirus) data using Tableau as an intelligence tool. Tableau can connect to files, relational databases, and Big Data sources to retrieve and process data. Because it offers real-time cooperation and data merging, the programme is very unique. With Tableau, data analysis can be completed very fast, and dashboards and workbooks are used to create visual visualizations of the data. A Tableau dashboard makes it possible to view many visualizations at once. It is commonly used to display only the most important info and is occasionally personalized. To function, it connects to data stored in many places. It has the ability to gather data from every imaginable source.

Tableau is capable of extracting data from many different sources, such as plain Excel sheets, PDFs, complex Oracle databases, and advanced cloud services like Amazon Web Services, Microsoft Azure SQL, and Google Cloud SQL. We introduce Tableau and describe how to use it to interactively visualize and analyse COVID-19 (Coronavirus) data in order to encourage its widespread use. Modern data analytics and visualization software called Tableau provides customers with convenience, usefulness, and adaptability.

We are using a dataset containing data from all countries between the period January 2020 and January 2021.

II. LITERATURE SURVEY

The COVID-19 pandemic has brought about an unprecedented global crisis that has affected almost every aspect of life, including healthcare, economy, social interactions, and education. With the widespread availability ofdata related to COVID-19, data visualization has become an important tool to help people understand the impact of the pandemic. Tableau, a data visualization software, has been widely used to create interactive dashboards that allow users to explore and analyse data related to COVID-19. In this literature review, we will explore some studies that have used Tableau, a data visualization software, to represent COVID-19data.

Zhang et al. [1] proposed that maps and time-series charts are just two examples of the various visualizations used in dashboards to display data on COVID-19 cases, deaths, hospitalizations, testing, and immunizations.

However, in the United States, research is scarce. So, the dashboard was limited to the USA

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Khanam et al. [2] proposed dashboards presenting information about the number of infected patients based on age groups, based on gender. The dashboard also shows the increasing rate of infected people with time and the confirmed cases, recovered cases and deaths till April 2020 using pie charts.

But, using this dashboard, it is very difficult to completely describe the nature of Covid 19 with the current data.

Leung et al. [3] proposed a dashboard in which bubble maps and choropleth maps are used to show the number of confirmed cases in the world. Using the column chart, the number of tests within a region in Canada are also shown in this dashboard. Line graph shows the daily confirmed cases in Canada.

However, this research is restricted only to Canada and can be enhanced further.

Keswani et al. [4] proposed a system which contains a dashboard using the data which was provided by the Government of United States of America.

However, the Covid-19 related data limits itself to the United States of America and doesn't contain data related to any other country.

Rastogi et al. [5] proposed a Covid-19 dashboard which provides a better understanding about the effects on different countries due to Covid maintained by plots and charts. The dashboard has visualized the total number of cases, casualties, recoveries, lockdown dates, and tests conducted in different countries to gain a better idea of the effects of Covid in the world.

However, there are some inconsistency in the data.

Bernasconi et al. [6] proposed a dashboard wherein visualizations are shown using Geo-Online Exploratory Data Visualization.

However, there are some gaps like the Geo- OEDV is not frequently used and is less user-friendly.

Soni et al. [7] proposed a system having dashboard that contains various graphs and charts to represent the Covid- 19 situation in India. Also shows the state-wise analysis of Covid and the vaccinated percent of population.

But it may get better with accuracy of the dataset.

Anand et al. [8] proposed a case control investigation of the monthly trends of Covid-assosiated mucormycosis in India in 2021 which are represented using bar graphs.

However, it may be researched further if data is available state-wise.

Vasundhara et al. [9] proposed a dashboard that contains visualizations of Covid-19 in India are presented using heatmaps, bubble charts, bar graphs, line graphs, etc.

It can be made complex using advanced visualization techniques.

III. DIFFERENT VISUALIZATIONS IN TABLE AND com

Designing effective data visualizations of COVID-19 using Tableau requires careful consideration of several design elements to communicate key insights and facilitate data exploration and analysis.

Below are some details of the design considerations for COVID-19 data visualization using Tableau:

1. Use appropriate chart types: Choosing the appropriate chart types is crucial in data visualization. Line charts are suitable for showing trends over time, while bar charts are useful for comparing values across categories. Heat maps and choropleth maps are useful for showing the density of cases across regions. Example:

i) Bar Charts: These are used to compare data that is categorized. To compare two categories, you can build ordinary bar charts, stacked bar charts, or grouped bar charts.
ii) Line Charts: To show trends over time or continuous data points, line charts are utilized. They work especially well for illustrating alterations and variations.

iii) Pie Charts: Pie charts are effective for displaying percentages or proportions since they show pieces of awhole. iv) Table: In Tableau, a "table visualization" is often a straightforward tabular data display, a la a spreadsheet, where rows and columns exhibit the data in a structured manner. It can be used to compare numbers, provide summary data, or display raw data.

v) Trend Lines: Tableau's trendline visualizations let you examine and highlight patterns or trends in your data. The general direction of data points over time or across several variables is depicted by trendlines.

vi) Packed Bubbles: Packed bubble charts use circles that are sized and placed according to the values they represent to display hierarchical data.

vii) Geographical Maps: Maps can be made by Tableau to display geographic data. You may draw heat maps, display custom geographic boundaries, or plot data points on a map.

2. Use appropriate colour schemes: Colour is a powerful tool in data visualization, and it can be used to highlight key information and patterns. For COVID-19 data visualization, colour schemes that use red and green colours are commonly used to indicate positive and negative trends, respectively. Using shades of blue or grey can be effective in highlighting areas of low or high infection rates.

3. Use interactive features: Interactive features in Tableau, such as filters, drop-down menus, and drill-down capabilities, can be used to facilitate data exploration and analysis. Interactive features allow users to interact with the data and analyse specific subsets of data.

4. Use clear and concise labels: Clear and concise labels are important to ensure that users understand the information presented in the visualization. Using descriptive titles, axis labels, and legends can help users understand the meaning of the visualization.

5. Use annotations: Annotations can be used to highlight specific data points or provide additional context to the data. Annotations can be used to add context to the visualization and make it easier for users to interpret the information.

6. Use a clear layout: A clear layout is essential to make the visualization easy to read and understand. The layout should be designed to highlight the most important

YMER || ISSN : 0044-0477 information and guide the user's attention to key insights.

7. Provide contextual information: It is important to provide contextual information about the data, such as the date range, data source, and definitions of key terms. This information can help users understand the data and its limitations.

8. Consider accessibility: Accessibility is important in data visualization to ensure that everyone can access and understand the information presented. Consider using high-contrast colours, alt-text for images, and providing alternative ways of accessing the information.

Here, in Fig 1 below, we have plotted a geographical map which is used to interpret the total confirmed cases in different countries of the world where the green colour is used for minimum confirmed cases and red colour is used for maximum confirmed cases.

In Fig 2 below, we have plotted another map visualization which is used to depict the total recovered cases in various countries of the world where light blue colour is used for minimum recovered cases and dark blue colour is used for maximum recovered cases.







Fig 2: Total Recovered Cases in different parts of the world Fig3:Maximum Deaths in different countries of the world

EASENESS OF USING TABLEAU IV.

The technology used to create data visualizations of COVID-19 using Tableau involves several components, including:

1. Tableau Desktop: Tableau Desktop is the primary tool used to create COVID-19 data visualizations. It allows users to

connect to various data sources, such as @SWfilesgdatabases, and APIs, and create visualizations using drag- and-drop functionality

2. Data sources: Data sources are the foundation of any data visualization. For COVID-19 data visualizations, sources of data include official government reports, academic research and public health databases. These data sources are often available in a tabular format and can be connected to Tableau Desktop.

3. Data preparation: Before creating a data visualization, the data needs to be prepared for analysis. This involves cleaning the data, transforming it into a suitable format, and creating calculated fields, such as daily new cases and rolling averages. Tableau has built-in data preparation tools that can help streamline this process.

4. Chart types: Tableau provides a range of chart types, including bar charts, line charts, scatter plots, heatmaps, and geographic maps. These chart types can be customized to display COVID-19 data in a variety of ways, such as showing trends over time, comparing data across regions, and displaying the density of cases.

5. Interactive features: Tableau provides interactive features, such as filters, drop-down menus, and drill- down capabilities, which allow users to interact with the data and analyse specific subsets of data. These features can help users gain insights and explore the data in more detail.

6. Publishing and sharing: Tableau provides the option to publish and share data visualizations with others. This can be done through Tableau Server or Tableau Public, which allow users to share their visualizations online, embed them in websites, or create interactive dashboards for others to use.

In Fig 3 below, we have a table which is showing the maximum deaths in various countries of the world.

Maximum Deaths (INTL)

Country/Re	
US	53,579,012
Brazil	30,930,502
India	20,038,210
Mexico	17,562,815
UK	13,269,383
Italy	12,079,637
France	10,576,325
Spain	9,712,626
Iran	7,289,607
Peru	6,371,638

YMER || ISSN : 0044-0477 In Fig 4 below, a table is used to depict the minimum deaths occurred in various countries around the globe.

Minimum Deaths (INTL)

Country/Region	Confirm	Deaths
Azerbaijan	1.000	0.000
('St. Martin',)	2.000	0.000
Cape Verde	1.000	0.000
Channel Islands	1.000	0.000
Curacao	2.000	0.000
East Timor	1.000	0.000
North Ireland	1.000	0.000
Republic of the Congo	1.000	0.000
St. Martin	2.000	0.000
The Gambia	1.000	0.000

Fig 4: Minimum Deaths in different countries of the world

In Fig 5 below, a trendline is used to show the trend of the Covid-19 virus across the globe during the period January 2020 and January 2021.



Fig 5: Trendline of Covid-19 outbreak in the entire world

ANALYTICAL AND CREATIVE WORK v

Box plots, also known as box-and-whisker plots, display a dataset's distribution together with its median, quartiles, and outliers.

In Fig 6 below, variation of covid-19 in each country is shown using box-and-whisker plots.





Fig 6: Variation of Covid-19 in the world

In Fig 7, Bubble maps are used to visualize the recovered cases in India. Size of the bubble is bigger for the state having maximum recovered cases in India.



Fig 7: Bubble Chart for the recovered cases according to the states in India

In Fig 8 below, a Pie Chart is used to visualize the number of confirmed cases in different states of India.



Fig 8: Pie Chart for confirmed cases according to different states in India

The analytical work involved in data visualization of COVID-19 using Tableau is focused on identifying key insights and trends in the data. Here are some examples of analytical work that can be done using Tableau:

1) Identifying trends over time:

Tableau can be used to create line charts that show the trend of COVID-19cases over time. By analysing these charts, analysts can identify patterns and trends, such as spikes or drops in case numbers, and determine whether measures to control the spread of the virus are effective.

2) Comparing data across regions:

Tableau can be used to create bar charts that compare COVID-19 cases and deaths across different regions. By analyzing these charts, analysts can identify regions with high or low infection rates, and identify potential reasons for the differences.

Analyzing demographic data:

Tableau can be used to create scatter plots or heat maps that show the relationship between COVID-19 cases and demographic data, such as age, gender, and ethnicity. By analyzing these visualizations, analysts can identify populations that are disproportionately affected by the virus.

YMER || ISSN : 0044-0477 4) Creating predictive models:

Tableau can be used to create predictive models that forecast COVID-19 cases and deaths based on historical data. By analyzing these models, analysts can identify potential future trends and prepare for them accordingly.

5) Exploring data using filters and drill-downs:

Tableau provides interactive features such as filters and drilldowns that allow users to explore the data in more detail. By using these features, analysts can identify patterns and trends in the data that may not be immediately apparent.

In Fig 9 below, a trendline for covid-19 in India is shown for each month.



Fig 9: Trendline for Covid-19 in India

VI. SIGNIFICANCE OF COVID-19 DATA VISUALIZATION

We require data analysis and visualizations since the COVID-19 (coronavirus) sickness is still spreading and affecting our way of life quickly. Tableau is widely used in this context as a tool that facilitates quick data analysis and generates visualizations for spreadsheets and dashboards.

We can create dashboards with Tableau that provide actionable information and accelerate business growth. If they are set up with the appropriate hardware and operating system, Tableau products can always be used in virtualized environments. With Tableau, you may deal with more COVID-19 (coronavirus) data that is not organized and construct different visualizations using the program's built-in tools.

In addition, we will be able to drill down into the COVID-19 (coronavirus) data in a variety of ways and quickly explore it. Without any long-term objectives in mind, Tableau assists organizations in the analysis of future data. We are experimenting with visualizations and viewing COVID-19 (coronavirus) data using various methods. We frame "what-if" queries and operate on the data in accordance with hypothetical visualizations and a feature of adding components for comparison and analysis. The primary advantage of Tableau is its user-friendliness.

This function shows that a person can function without any technical or coding skills. Since each visualization in Tableau is integrated and self-depicting, the majority of its elements are available in a drag and drop format. Tableau must be included in the process since, in today's data-driven

Tableau enables you to create amazing visualizations while working with more unordered data. We can accomplish that while looking at the facts from various perspectives.

In Fig 10 below, using bar charts we are able to visualize the monthly trend of mucormycosis, an eye disease, which would appear in some patients as an after-effect of Covid- 19.



Fig10: Monthly Trends of Covid-19 assosiated mucormycosis in India in 2021

In Fig 11 below, using map visualization, we are able to identify whether there is a Covid-19 patient present in a respective state or not.



Fig 11: Covid-19 in various states of India

Similar to line charts, area charts have filled space below the line.

In Fig 12 below, a forecast of Covid-19 in India in the year 2021 is made. Forecast is basically prediction of the future using the current trend. For this, area charts are used.



Fig 12: Forecast of Covid-19 in India

VII. COVID-19 DASHBOARDS

1. COVID-19 DASHBOARD OF INDIA

This Dashboard contains details about the confirmed Covid- 19 cases in India according to states using a Pie Chart. It also contains a Bubble chart which is used to visualize the number of recovered cases in each state. In Bubble Charts, larger the size of the bubble, more are the number of recovered cases in that state.

It also contains the Forecast of Covid-19 in India using Area Chart. Forecast is used to predict the future outbreak of Covid-19. In this dashboard, prediction of the future of Covid- 19 in the year 2021 is done.

Trendline is also present in the dashboard to show the trends of Covid-19 using line charts according to each quarter in the year 2020.

Finally, it contains a geographical map visualization which shows the presence of Covid-19 in a state.



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2. COVID-19 DASHBOARD OF THE WORLD

This is a dashboard which contains the Covid-19 details about the entire world according to each country's data.

It contains a map visualization of the confirmed cases in each country across the globe. Green colour is assigned to countries having less cases and red colour is assigned to countries having the most cases. The dashboard contains another geographical map which is used to visualize the recovered Covid-19 cases in each country.

Here, light blue is colour is assigned to countries having very less recovered cases while dark blue is assigned to countries having the maximum recovery.

Box plots are also used in this dashboard to show the variation of Covid-19 in various countries of the world.

Line charts are used to show the trendline of Covid-19 in the world according to each quarter in the year 2020.

Finally, we contain two tables which contain data about the minimum and maximum deaths in different countries of the world in the year 2020.



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VIII. CONCLUSION

In conclusion, COVID-19 data visualization using Tableau is a useful method for presenting complex data in a clear and understandable manner. With the help of Tableau's robust visualization tools, analysts can produce a variety of graphs, maps, and charts that can highlight key patterns and insights in the data, including the evolution of the virus over time, regional variations in infection rates, and potential demographic factors influencing the virus' spread.

Using the visualizations, users can:

1. Track Trends:

Users can see the initial outbreak, peaks, and succeeding waves of the infection by viewing patterns over time. Understanding the efficacy of therapies and the likelihood of revival is made easier by this.

2. Geographical Analysis:

Geospatial visualizations highlight the impact on various nations and areas. Users may locate infection hotspots and variants, which helps with resource allocation and focuses actions.

3. Comparative Analysis:

It is possible to compare the effects of COVID-19 by visualizing data from various locations or nations, which also makes it easier to spot trends, variations in response methods, and likely causes of different results.

4. Impact of Interventions:

Users can evaluate the efficacy of various strategies in containing the virus's spread by superimposing intervention schedules (lockdowns, mask mandates, etc.) with infection rate data.

5. Vaccination Progress:

It is easy to understand the significance of vaccination efforts when you can visualize immunization rates and their effect on lowering infection rates and serious outcomes.

6. Public Awareness:

As they make the data more accessible and simpler to understand, compelling visualizations can increase public awareness and promote adherence to rules.

Overall, Tableau has demonstrated to be a crucial tool for COVID19 data visualization, allowing analysts to get crucial insights into the pandemic that can assist direct public health policy decisions and support efforts to stop the virus' spread.

Using Tableau to create a COVID-19 dashboard can be an effective approach to visualize and examine data connected to pandemics.

Providing clear and pertinent information, enabling user interaction with the data, and presenting the data in a visually appealing and understandable way are all essential components of a COVID-19 dashboard.

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